

WHAT IS CLAIMED IS:

1. A method of fabricating a magnetic memory device, comprising;
  - providing a workpiece having a plurality of first conductive lines formed thereon and a magnetic stack material disposed over the first conductive lines;
  - depositing a thin conductive hard mask over the magnetic stack material;
  - patterning the thin conductive hard mask with a pattern for at least one magnetic memory cell;
  - patterning the magnetic stack material with the at least one magnetic memory cell pattern to form at least one magnetic memory cell;
  - depositing a conductive material over the thin conductive hard mask;
  - patterning the conductive material to form at least one conductive stud over the thin conductive hard mask, wherein the at least one conductive stud is fully landed on the thin conductive hard mask; and
  - forming a plurality of second conductive lines over the at least one conductive stud, the second conductive lines running in a different direction than the first conductive lines.
2. The method according to Claim 1, wherein depositing the thin conductive hard mask comprises depositing a material layer having a thickness of 50 to 500 Angstroms.
3. The method according to Claim 1, wherein depositing the thin conductive hard mask comprises depositing TiN, Cu, Al, Ta, TaN or a combination thereof.

4. The method according to Claim 1, wherein depositing the thin conductive hard mask comprises depositing a cap layer over the magnetic stack material.
5. The method according to Claim 1, wherein the magnetic stack material comprises a layer of TaN, Ta, PtMn or IrMn, CoFe, Ru, Al<sub>2</sub>O<sub>3</sub>, and NiFe, CoFe or NiCoFe disposed sequentially over one another.
6. The method according to Claim 5, wherein the magnetic stack material further comprises a layer of TaN disposed over the top NiFe, CoFe or NiCoFe layer, wherein the top TaN layer comprises the thin conductive hard mask.
7. The method according to Claim 1, wherein the at least one conductive stud has a greater lateral width than the magnetic memory cell.
8. The method according to Claim 1, wherein depositing the conductive material comprises depositing 500 to 2000 Angstroms of Al, Cu or a combination thereof.
9. The method according to Claim 1, wherein forming at least one magnetic memory cell comprises forming a magnetic random access memory (MRAM) cell.

10. A method of fabricating a magnetic memory device, comprising;

- providing a workpiece;
- depositing a first insulating layer over the workpiece;
- forming a plurality of first conductive lines in the first insulating layer;
- forming a magnetic tunnel junction (MTJ) stack material over the first conductive lines and first insulating layer;
- depositing a thin conductive hard mask over the MJT stack material;
- depositing a first photoresist over the thin conductive hard mask;
- patterning the first photoresist with a pattern for a plurality of magnetic memory cells;
- using the first photoresist to pattern the thin conductive hard mask;
- using the thin conductive hard mask to pattern the MTJ stack material and form a plurality of magnetic memory cells in the MTJ stack material;
- depositing a conductive material over the thin conductive hard mask;
- depositing a second photoresist over the conductive material;
- patterning the second photoresist;
- using the second photoresist to pattern the conductive material to form a conductive stud over each magnetic memory cell, wherein each conductive stud is fully landed on the thin conductive hard mask over each underlying magnetic memory cell; and
- forming a plurality of second conductive lines over the plurality of conductive studs, the second conductive lines running in a different direction than the first conductive lines.

11. The method according to Claim 10, wherein depositing the thin conductive hard mask comprises depositing a material layer having a thickness of 50 to 500 Angstroms.

12. The method according to Claim 10, wherein depositing the thin conductive hard mask comprises depositing TiN, Cu, Al, Ta, TaN or a combination thereof.
13. The method according to Claim 10, wherein depositing the thin conductive hard mask comprises depositing a cap layer over the magnetic stack material.
14. The method according to Claim 10, wherein the magnetic stack material comprises a layer of TaN, Ta, PtMn or IrMn, CoFe, Ru, Al<sub>2</sub>O<sub>3</sub>, and NiFe, CoFe or NiCoFe disposed sequentially over one another.
15. The method according to Claim 14, wherein the magnetic stack material further comprises a layer of TaN disposed over the top NiFe, CoFe or NiCoFe layer, wherein the top TaN layer comprises the thin conductive hard mask.
16. The method according to Claim 10, wherein each conductive stud has a greater lateral width than the underlying magnetic memory cell.
17. The method according to Claim 10, wherein depositing the conductive material comprises depositing 500 to 2000 Angstroms of Al, Cu or a combination thereof.
18. The method according to Claim 10, wherein forming the plurality of magnetic memory cells comprises forming magnetic random access memory (MRAM) cells.

19. A magnetic memory device, comprising;

a workpiece;

a first insulating layer disposed over the workpiece;

a plurality of first conductive lines disposed in the first insulating layer;

a plurality of magnetic memory cells disposed over the first conductive lines;

a thin conductive hard mask material disposed over and abutting each magnetic memory cell;

a conductive stud disposed over and abutting the thin conductive hard mask over each magnetic memory cell, each conductive stud being fully landed on the thin conductive hard mask disposed over the underlying magnetic memory cell; and

a plurality of second conductive lines disposed over and abutting the conductive studs, the second conductive lines running in a different direction than the first conductive lines.

20. The magnetic memory device according to Claim 19, wherein the thin conductive hard mask material comprises a thickness of 50 to 500 Angstroms, wherein the conductive studs comprise a thickness of 500 to 2000 Angstroms.

22. The magnetic memory device according to Claim 19, wherein the thin conductive hard mask material comprises TiN, Cu, Al, Ta, TaN or a combination thereof, and wherein the conductive studs comprise Al, Cu or a combination thereof.

23. The magnetic memory device according to Claim 19, wherein the thin conductive hard mask material comprises a cap layer of the magnetic stack material.

24. The magnetic memory device according to Claim 19, wherein the magnetic memory cells comprises a layer of TaN, Ta, PtMn or IrMn, CoFe, Ru, Al<sub>2</sub>O<sub>3</sub>, and NiFe, CoFe or NiCoFe disposed over one another.

25. The magnetic memory device according to Claim 19, wherein each conductive stud has a greater lateral width than the underlying magnetic memory cell.

26. The magnetic memory device according to Claim 19, wherein the device comprises a magnetic random access memory (MRAM) device.